

Automation, On

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Abstract

This project is intended to emphasize how using wearable technology (whether its a watch, glasses, etc.) in daily life can be more productive and bring easiness to the structure of life. Using voice recognition through Motorola's Android Wear Smartwatch: Moto 360 and a web application programming interface (API), the wearer of the device can easily say a transparent command like "Turn on the coffee maker" and the coffee maker would turn on without having to physically touch the coffee maker.

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Introduction

Technology has advanced so much to the point of where one can no longer live without it. One can control many devices with a simple swipe on a tablet or phone. Phones have become so advanced that an mp3 player, a camera, or GPS are no longer needed. Integration of cutting edge technology allows humans to have a more efficient way of living. Home Automation allows for effortless control of home appliances, or anything else that runs on electricity. Technology has become so small and advance that it is now wearable. Motorola's Android Wear Smartwatch: Moto 360 is one example of wearable technology. It allows the user to get notifications from any android phone. The Moto 360 watch allows the user to responded to messages while using voice recognition. When you have this technology combined with a server, it allows the user to use voice recognition instead of using the touchscreen.

Android Wear/Moto 360

Android Wear is technology that can be worn and used similar to Google Glass.

Motorola's Android Wear Smartwatch: Moto 360 is the device used with this project.

Currently, there are three watches available to purchase: Samsung Gear Live, LG G , and the Moto 360. There are rumors that apple will eventually join wearable technology sometime next year.

Why wearable technology? The answer can be given in one word: efficiency.

Technology has made the way of living more accessible and efficient. The purpose of having a wrist watch is so you simply glance at your wrist and the information you need is right there. Android developers took that concept and added some features that android phones have.

With wearable technology, you are able to receive notifications, send messages, and add information to the calendar. This project leverages some of the features that the watch already has - the voice recognition system and takes it to the next level. using the features of the smartwatch has we can have effortless control of home appliances. Everything can be done wirelessly and it also becomes power efficient because devices can be turned off when not in use. Being wireless allows the user to have full control without the confusion of multiple wires. Voice recognition is used in this project as the input for the Moto 360 to take commands. The Moto 360 connect via bluetooth to an android phone and sends the command to a server.

Voice Recognition

In this project the voice recognition function of the wearable technology - Moto 360 was used as a medium for the user to connect to the home automation server. Voice input can specify an appliance to use (lamp, coffee maker, etc.) and a state (on/off or toggle). “Voice recognition is the process of taking the spoken word as an input to a computer program. This process is important to virtual reality because it provides a fairly natural and intuitive way of controlling the simulation while allowing the user's hands to remain free”¹. Commands could also be issued to the server via a web app, smartphone app, or automatically from another server.

¹ Baumann, J. (2005). Voice Recognition - Human Interface Technology Laboratory. Retrieved from http://www.hitl.washington.edu/research/knowledge_base/virtual-worlds/EVE/I.D.2.d.VoiceRecognition.html.

Snippet of Java Main Activity Wear App Code

```
public void onButtonClicked(View target) {
    displaySpeechRecognizer();
}

private static final int SPEECH_REQUEST_CODE = 0;

// Create an intent that can start the Speech Recognizer activity
private void displaySpeechRecognizer() {
    Intent intent = new Intent(RecognizerIntent.ACTION_RECOGNIZE_SPEECH);
    intent.putExtra(RecognizerIntent.EXTRA_LANGUAGE_MODEL,
        RecognizerIntent.LANGUAGE_MODEL_FREE_FORM);
    // Start the activity, the intent will be populated with the speech text
    startActivityForResult(intent, SPEECH_REQUEST_CODE);
}

// This callback is invoked when the Speech Recognizer returns.
// This is where you process the intent and extract the speech text from the intent.
@Override
protected void onActivityResult(int requestCode, int resultCode,
    Intent data) {
    if (requestCode == SPEECH_REQUEST_CODE && resultCode == RESULT_OK) {
        List<String> results = data.getStringArrayListExtra(
            RecognizerIntent.EXTRA_RESULTS);
        String spokenText = results.get(0);
        mTextView.setText("Command entered:\n" + spokenText);
        voiceInputToMessage(spokenText);
    }
    super.onActivityResult(requestCode, resultCode, data);
}

protected void voiceInputToMessage(String input) {
    String message = "none";
    if (input.equals("turn on the lights") ||
        input.equals("lights on") ||
        input.equals("let there be light") ||
        input.equals("make me a cup of coffee") ||
        input.equals("make me some coffee")) {
        message = "on";
    }
    else if (input.equals("turn off the lights") ||
        input.equals("lights off") ||
        input.equals("lights out") ||
        input.equals("let darkness envelop the land")) {
        message = "off";
    }
}
```

Snippet of Java Main Activity Mobile App Code

```
@Override
public boolean onOptionsItemSelected(MenuItem item) {
    // Handle action bar item clicks here. The action bar will
    // automatically handle clicks on the Home/Up button, so long
    // as you specify a parent activity in AndroidManifest.xml.
    int id = item.getItemId();

    //noinspection SimplifiableIfStatement
    if (id == R.id.action_settings) {
        return true;
    }

    return super.onOptionsItemSelected(item);
}

public class MessageReceiver extends BroadcastReceiver {
    @Override
    public void onReceive(Context context, Intent intent) {
        String message = intent.getStringExtra("message");
        if (message.equals("on")) {
            //send on HTTP request
            Log.d("message", "Turning appliance on...");
            mTextView.setText("Turning appliance on...");
            HttpAsyncTask get = new HttpAsyncTask();
            get.execute("http://172.20.10.10/gpio.php?relay=1&mode=on");
        }
        else if (message.equals("off")) {
            //send off HTTP request
            Log.d("message", "Turning appliance off...");
            mTextView.setText("Turning appliance off...");
            HttpAsyncTask get = new HttpAsyncTask();
            get.execute("http://172.20.10.10/gpio.php?relay=1&mode=off");
        }
        else if (message.equals("none")) {
            //do nothing
            Log.d("message", "Invalid message.");
            mTextView.setText("Invalid message.");
        }
    }
}

public class HttpAsyncTask extends AsyncTask<String, Void, Boolean> {
    @Override
    protected void onPreExecute() {
        super.onPreExecute();
    }
}
```

Home Automation Server

According to PC magazine, home automation is “automating the ability to control items around the house”² and they compare home automation to using “the clapper and beaming up to Starship Enterprise”. It increases your comfortability at home because you can make changes around the house, like - turning on a light or the coffee maker. In this project we leveraged the voice recognition component of the Moto 360 smartwatch to connect to our server.

Our home automation server uses Motorola's Android Wear Smartwatch: Moto 360 to talk to the Raspberry Pi server via API. The API can turn the relays on or off, or toggle their state and trigger the relay switches to fire. It also allows for programmers to write apps that control power via the internet - which is how the smartwatch connected to the server.

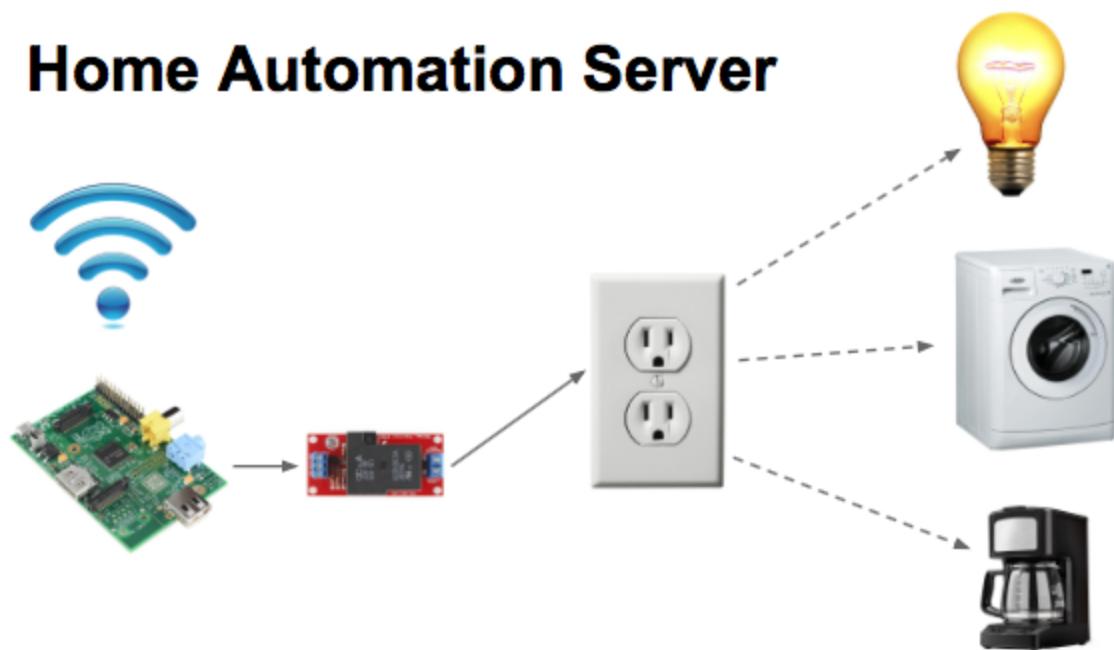
Any device, machine, or product that can connect to a standard wall outlet can be plugged into the power socket. Power can be wired into the box to control remote devices such as a socket in another room or a device in another room
Uses widely available, inexpensive components

For example: an app that brews coffee for you at 5:50am so that your coffee is ready at 6:00am when you get up.

² (2013). How Can I Get Started with Home Automation? - Lifehacker. Retrieved December 6, 2014, from <http://lifehacker.com/how-can-i-get-started-with-home-automation-510246491>.

Home Automation Server Diagram

Home Automation Server



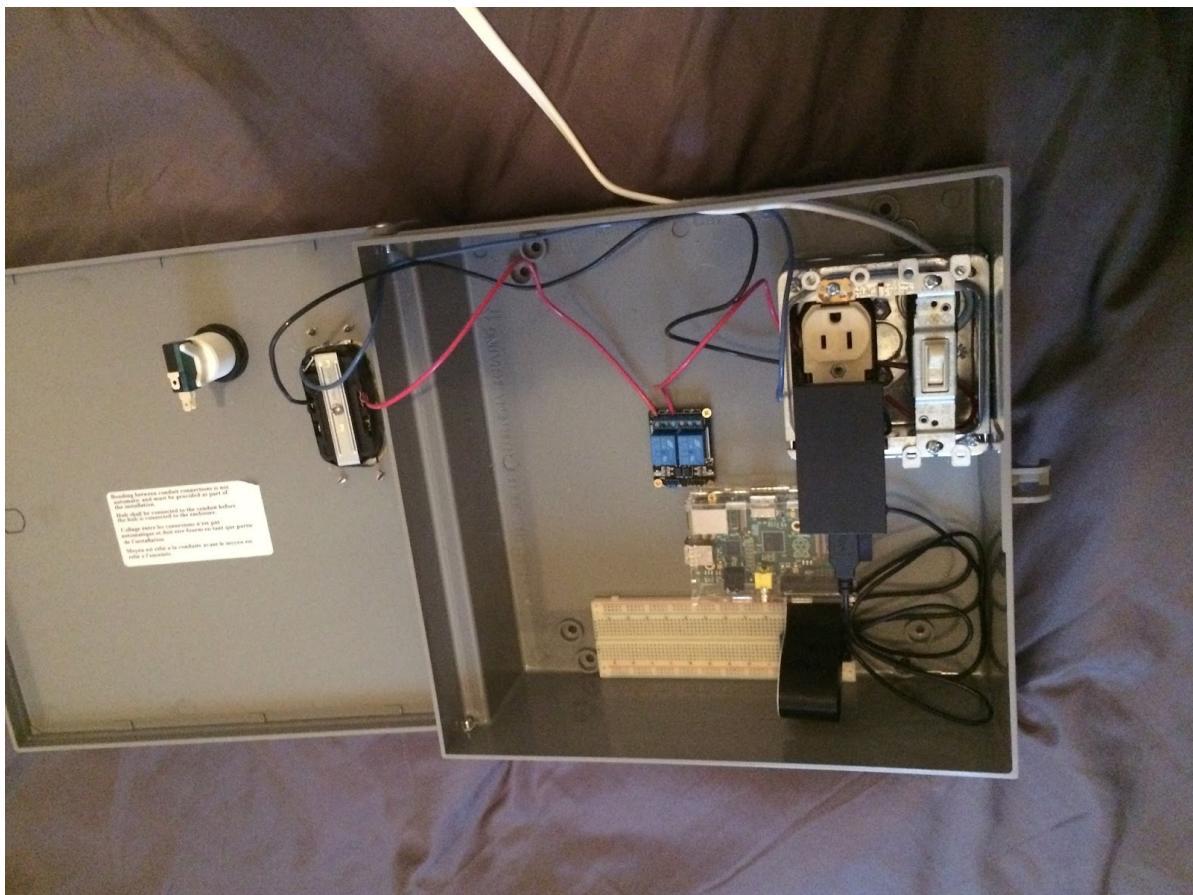
Hardware Used:

- 1 Raspberry Pi,
- 1, 8 Way Relay Switch
- 1 Power Cord
- 1 Electrical Box
- 2 Power Outlets
- 1 Power Switch
- 1 Electrical Wire
- 1 White Power Button

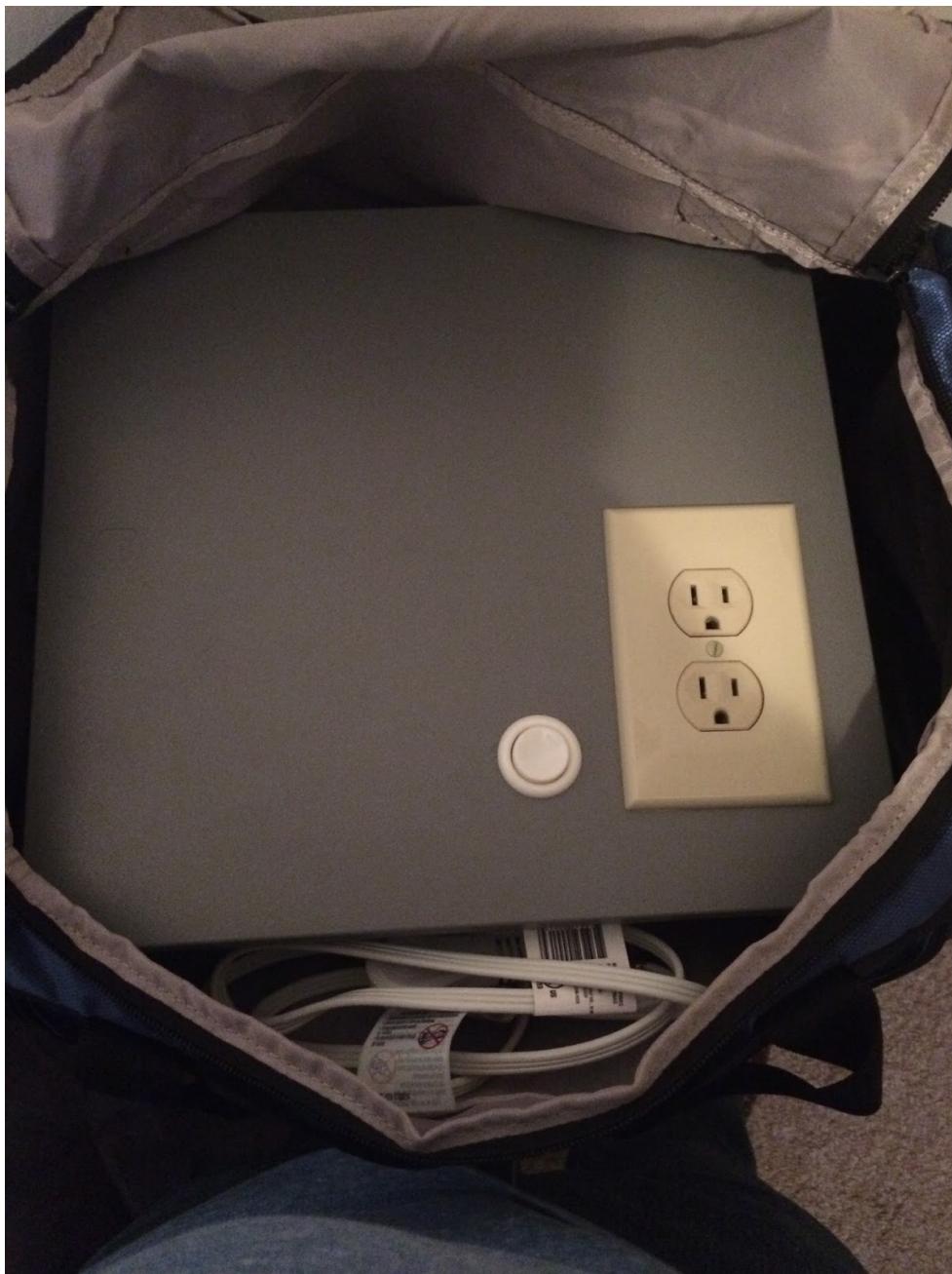
Above is a diagram illustrating all the components of the home automation ecosystem and how they work together. The wifi enabled Raspberry Pi connects to the relay switch which connects to the power outlet. All of the devices connected to the power outlet (lamp, washing machine, coffee maker) can be controlled through the Raspberry Pi.

Below is a picture of the server setup:

Inside of the server box



Outside of the Server Box



References

- Baumann, J. (2005). Voice Recognition - Human Interface Technology Laboratory. Retrieved from http://www.hitl.washington.edu/research/knowledge_base/virtual-worlds/EVE/I.D.2.d.VoiceRecognition.html.
- (2013). How Can I Get Started with Home Automation? - Lifehacker. Retrieved December 6, 2014, from <http://lifehacker.com/how-can-i-get-started-with-home-automation-510246491>.
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